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Microbial Water Pollution of Drin River in Scutary Area, Albania

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Abstract

Black Drin River joining White Drin and some other small rivers form the longest river of Albania, Drin River, 335 Km long. Drin has two distributaries, one of which empties directly into Adriatic Sea and the other one into Buna river, in Scutary (Shkoder). The Drin area is beautiful and very important for the Albanian economy, for the electricity and has a large agriculture activity as well. Unfortunately mismanagement of agricultural practices and the discharge of industrial and urban wastes into the river are causing a high pollution. River conservation is threatened by pollution. Drin river water is used by people for fishing, swimming and irrigation of plants and the pollution of this river is a problematic issue in environment and human health. We monitored microbial and chemical water pollution of Scutary area of Drin, where Drin goes into Bojana, during 2012-2013 and a high water pollution level was recorded.

Key words: Microbial pollution, fecal coliforms, CFU, Drin, Bojana

1. Introduction

Drin River is the longest river in Albania, 335 km long; is formed by Black Drin River joining White Drin and some other small rivers. Drin has two distributaries, one of which empties directly into Adriatic Sea and the other one into Buna river, in Shkoder. The Drin area is beautiful and very important for the Albanian economy, for the electricity and has a large agriculture activity as well. [5].Unfortunately mismanagement of agricultural practices and the discharge of industrial and urban wastes into the river are causing a high pollution. River conservation is threatened by pollution. Pathogenic organisms are normal components of all ecosystems, but microbiological contamination with fecal bacteria subsequent to anthropogenic activity is considered to be a crucial issue throughout the rivers and especially in the Drin River Drin river water is used by people for fishing, swimming and irrigation of plants and the pollution of this river is a problematic issue in environment and human health. Assessment of surface-water quality continues to be of main public interest in the developed and developing world. There is a strong demand for monitoring water quality [3, 8], therefore the assessment of the presence of pathogenic bacteria in water represents a major concern for human and animal health protection [10]. Bacteria are ideal markers of microbial pollution of surface waters because of their quick response to environmental changes. Fecal coliforms and intestinal enterococci are excellent indicators for assessing fecal pollution and the potential presence of pathogenic agents. Fecal coli form bacteria are a specific subgroup of coli form bacteria. The coli form bacteria live in large numbers in the intestines of warm and cold blooded animals. Fecal coli form bacteria are associated only with the fecal material of warm-blooded animals and may be separated from the total coli form group by their ability to use lactose at 44-45ºC. The presence of fecal coli form bacteria in water indicates it's contamination with fecal material and the fecal contamination is an indicator that exist the possibility of the contamination with pathogens. Coliform organisms are used as indicators of water pollution [1, 2].

The aim of this study is to assess the microbial water pollution using as indicators fecal coliforms and heterotrophic bacteria and to classify the water of Drin River on the basis of standard parameters, faecal pollution.

2. Materials and methods

This study was conducted during 12 month monitoring period. The microbial parameters were examined for a number of samples from three selected sampling sites at regular intervals during the 2012-2013 years. The sampling sites on the Drin River are: D1 is on the left of the river close to Bahçallek Bridge; the D2 on the right, 1 km far from D1, and the

D3 is in the join point of Drin to Buna, 2 km far from D1.

Water samples were taken in sterile conditions, transported in a chilly bin to ensure water temperature below 10^0C and were analyzed within 30 hours from the time the first sample in the field was take in the Laboratory of Microbiology at Faculty of Sciences, University of Tirana. The sampling and the tests were conducted in accordance with European and World Standard Methods. [1, 2, 9].

The method we used was plating and the MPN **(Most Probable Number)** test. The nutrient Media LB, EC, YEA and Mac Konkey are used for Water tests and the incubation was done at 37ºC for 24-48 hours. Looking for gas production tubes, the confirmation test in Mc Konkey media plating was used and the indol test as well. The measurement is done by using the MPN statistical tables for river waters and is expressed as the number of organisms per 100 ml (CFU/100ml) [4, 7].

3. Results and discussion

The summary of microbiological parameters of Drin River is presented in table 1. The site D3 is the most polluted except for the presence of heterotrophic bacteria. In these site heterotrophic bacteria varies from 310000 CFU/100mL to 161000 CFU/100 ml. We see that from D3 site in to D1 site, heterotrophic counts are reduced. In the D1 site the count varies from 210000 to 120000 CFU/100 ml. We think that heterotrophic counts reduce along the river till the discharging point of the river in the reservoir because of the processing of the water from the River bed. The same conclusion is reached earlier by others [7, 8].

Table 1. Summary of microbiological parameters of Drini River in three sites of monitoring

Sampling sites		*Parameter*	
		Fecal coliforms, CFU/100mL	CC 37°C, CFU/100ml
D1	Mean	6991.667	159333.3
	Min	3900	120000
	Max	9300	210000
	SD	1845.121	31002.44
D_2	Mean	19316.67	214833.3
	Min	12000	145000
	Max	39000	310000
	SD	7878.836	52362.08
D_3	Mean	15533.33	233083.3
	Min	11000	161000
	Max	24000	310000
	SD	4058.063	55743.66

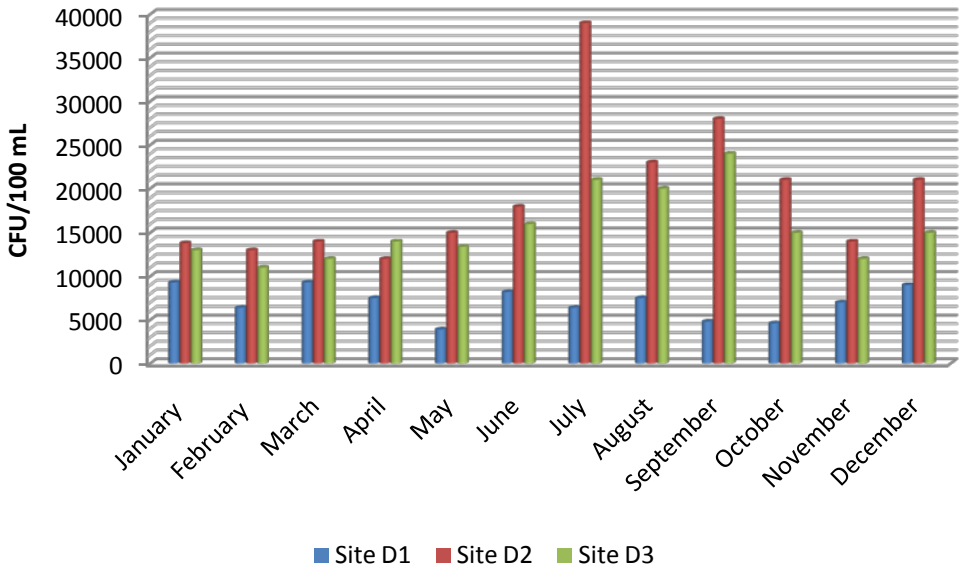

Figure 1. Fecal coliforms in three sites of monitoring

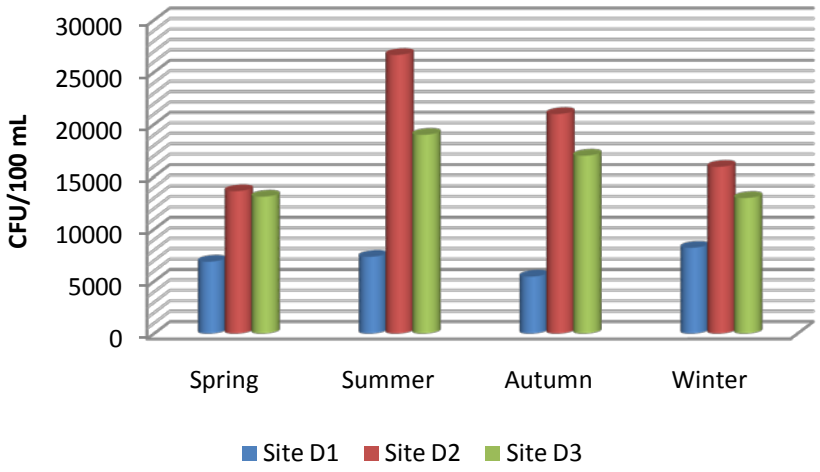

Figure 2. Fecal coliforms in three sites of monitoring in relation with seasons

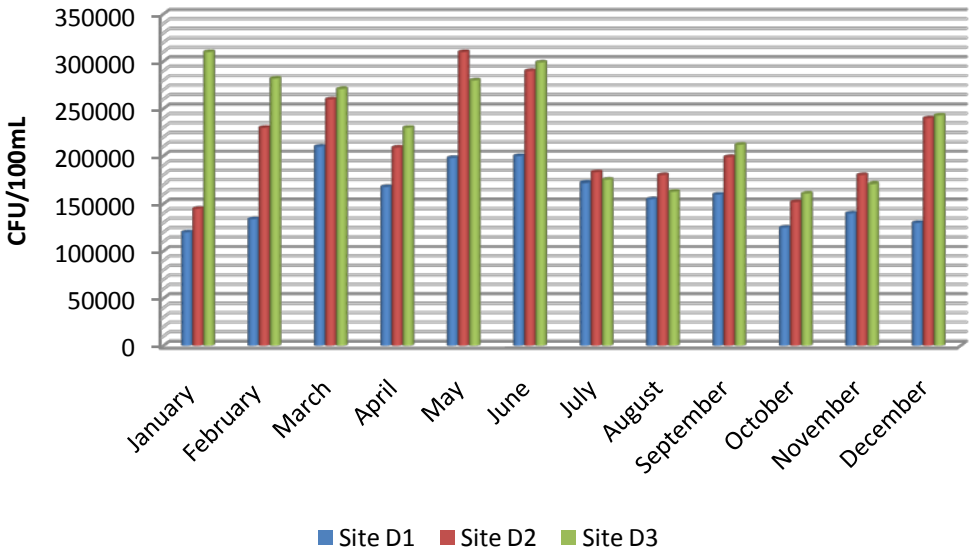

Figure 3. Heterotrophs in three sites of monitoring

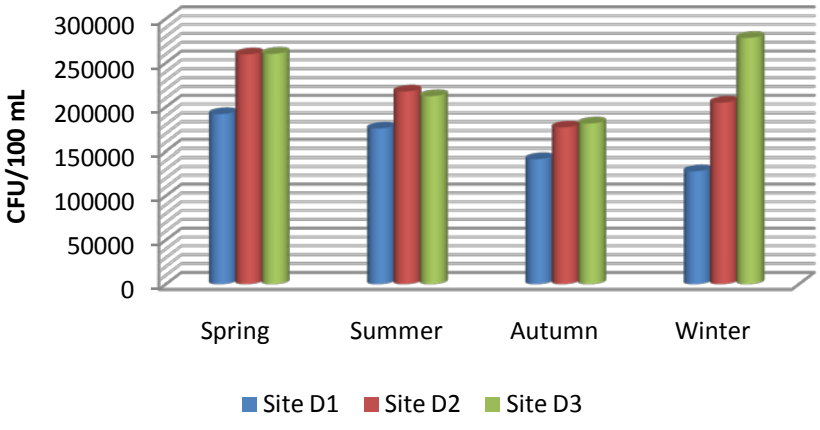

Figure 4. Heterotrophs in three sites of monitoring in relation with seasons

Table 2. EU Standard ISO 7899-1

Fecal Coliforms	*Very good*	*Good*	*Bad*	*Very Bad*
CFU/100ml	250-500	500-1000	1000-2000	Over 2000

The heterotrophic counts are higher than fecal coliforms. Fecal coliforms follow the same course of heterotrophic counts from site D3 to site D1 except site D2 which is more polluted. This can be explained because of the anthropogenic factor in the area. Fecal coliforms in site D2 varies from 39000 to 12000 CFU/100 mL

Figure 1 represents the variation of fecal coliforms in three sites during the monitoring period. We observed the high pollution in site D3 in relation with other sites.

Figure 2 gives the seasonal variation of fecal coliforms in three sites of monitoring. It is clearly observed the high level of fecal coliforms in the summer season. This can be explained with the effect of higher water temperature in the microbial growth .Site D2 that presents an average count higher than other sites have maximum count in summer; this fact reinforces the idea of the anthropogenic factor in the tourism season.

Figure 3 represents the variation of heterotrophic count in three sites during the monitoring period. We observed the high pollution in site D3 in relation with other sites in January.

In figure 4 are shown heterotrophic count in relation with seasons. In winter season are observed high levels of heterotrophic counts. Site D3 is the site is in the join point of Drin to Buna and during the winter the level of water increases and deteriorate because of rainfalls. After rainfalls high level of turbidity is associated with increasement of bacterial load [4, 7].

Microbiological water quality of River Drin and has been assessed by the concentrations of standard microbiological parameters, classified by quality classes (table 2). The monitoring results of fecal coliforms compared to EU standards given in table 2 indicate that water Drin River in Shkoder area is bad quality [2, 3].

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